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See application file for complete search history.

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- (58) **Field of Classification Search**  
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(56) **References Cited**

## U.S. PATENT DOCUMENTS

2,837,880	A	6/1958	Rosenblatt
3,475,786	A	11/1969	Pearson
5,630,353	A	5/1997	Mittlefehldt et al.
5,851,320	A	12/1998	Auran et al.
6,530,149	B2	3/2003	Sugiura et al.
6,725,910	B2	4/2004	Ishida
6,941,852	B1	9/2005	Le et al.
7,275,409	B1	10/2007	Wu
2012,0260882	A1	10/2012	Martins et al.

## FOREIGN PATENT DOCUMENTS

CN	105480376	A	4/2016
CN	205349422	U	6/2016

## OTHER PUBLICATIONS

International Search Report dated Jun. 25, 2015 for PCT/US15/22392.

“Balloon-O-Therapy Twisting Balloons with FewDolt” with published date of Mar. 10, 2013 (wayback machine date of Jul. 19, 2013). <https://web.archive.org/web/20130719201940/http://balloonotherapy.blogspot.com/2013/03/letter-balloon-twisting-abc.html>.

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(57) **ABSTRACT**

Disclosed are hollow pistons made from a single piece of starting material and methods of manufacturing unitary hollow pistons from a single solid rod as a starting material.

